IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	John M. Morgenstern; James B. Bach; Alan E. Arslan		
Assignee:	Supersonic Aerospace International, LLC		
Title:	Methods For Configuring Aircraft To Meet Performance Goals And Shock Wave Disturbance Constraints		
Serial No.:	10/714,276	Filing Date:	November 14, 2003
Examiner:	Dinh, Tien Quang	Group Art Unit:	3644
Docket No.:	SAI.P011 US	KB Ref. No.:	1023.P011 US

Irvine, California
November 30, 2006

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APPELLANT'S BRIEF

Dear Sir:

This paper is responsive to the Final Office Action dated June 30, 2006, to which a Notice of Appeal was filed on Aug. 30, 2006. A one-month extension of time is hereby requested setting a period for filing Appellant's Brief that expires November 30, 2006. Reconsideration is respectfully requested.

I. REAL PARTY IN INTEREST

The entire interest in the present application has been assigned to Supersonic Aerospace International, LLC, a Nevada Limited Liability Company, having a place of business at 2250 E. Tropicana Avenue, Suite 19-121, Las Vegas, NV 89119, as recorded at reel 014711, frame 0697.

II. RELATED APPEALS AND INTERFERENCES

No other appeals or interferences are known to the appellant, the appellant's legal representative, or assignee which will directly affect or be directly affected by or have bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-12 and 29-39 are pending in the application. Claims 1-12 and 29-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over the publications entitled "Sonic Boom Minimization With Nose-Bluntness Relaxation" by Christine M. Darden, NASA Technical Paper 1349, pp. 1-51 (NASA 1979) (hereinafter "Darden") in view of Makino *et al.*, "Non-Axisymmetrical Fuselage Shape Modification For Drag Reduction of a Low Sonic-Boom Airplane", AIAA 2003-557, January 6, 2003 (hereinafter "Makino"), or Howe, Donald, "Sonic Boom Reduction Though The Use of Non-Axisymmetric Configuration Shaping", AIAA 2003-929 (hereinafter "Howe").

Claims 13-28 are canceled.

The rejections of Claims 1-12 and 29-39 are on appeal.

IV. STATUS OF AMENDMENTS

The appellant's reply dated April 12, 2006, in response to the non-final office action dated January 12, 2006, was entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claim 1 pertains to a method for configuring an aircraft for low sonic boom supersonic flight conditions. The method includes scaling an equivalent area distribution curve of the aircraft (212) (FIG. 2) to approximate an ideal equivalent area distribution goal curve (300) (FIG. 5B). The method further includes relaxing a design constraint to require the equivalent area distribution curve of the aircraft (506) (FIG. 5B) to be at or below the equivalent area distribution goal curve. The elements of Claim 1 are described at least in paragraphs [00015] - [00019] and page 14 [00040] - page 17 [00035] of the specification, and are shown at least in Figures 2, 3, 5B, and 5J.

Independent Claim 29 pertains to a method for configuring an aircraft for supersonic flight with low shock wave disturbance constraints comprising redistributing lift of a wing by configuring the wing with areas of far-field expansion ahead of areas of far-field compression (212) (FIG. 2) and (506), (510) (FIG. 5C); and scaling an equivalent area distribution goal curve to maintain the desired aircraft weight (532) (FIG. 5J) while countering excursions below the equivalent area distribution goal curve (212) (FIG. 2) and (506) (FIGS. 5B and 5J). The elements of Claim 29 are described at least in paragraphs [00015] - [00019] and page 14 [00040] - page 17 [00035] of the specification, and are shown at least in Figures 2, 3, 5B, 5C and 5J.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether independent claims 1 and 29 and corresponding dependent claims 2-12 and 30-39 are unpatentable over Darden, Christine M., "Sonic Boom Minimization With Nose-Bluntness Relaxation", NASA Technical Paper 1349, pp. 1-51 (NASA 1979) (hereinafter "Darden") in view of Makino *et al.*, "Non-Axisymmetrical Fuselage Shape Modification For Drag Reduction of a Low Sonic-Boom Airplane", AIAA 2003-557, January 6, 2003 (hereinafter "Makino"), or Howe, Donald, "Sonic Boom Reduction Though The Use of Non-Axisymmetric Configuration Shaping", AIAA 2003-929, January 6, 2003 (hereinafter "Howe"), taking into account all limitations of the claims.

VII. ARGUMENT

1. Rejection of Independent Claims 1 and 29 under 35 U.S.C. §103

Independent Claims 1 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Darden in view of Makino or Howe. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." MPEP § 2143. In the present case, Darden, alone or in combination with Makino and/or Howe, do not teach or suggest all the claim limitations, nor is there any motivation or suggestion to modify the teachings of the cited references to provide the claimed features.

Darden discloses a method for compromising between sonic boom levels and prohibitive drag penalties by defining the proper ratio of the length of the conical nose region of the equivalent area distribution (y_f) to the overall length of the aircraft (l). (See Darden, p. 13, Concluding Remarks). Darden's analysis teaches relaxing the bluntness of the <u>nose</u> to reduce drag. (Darden, Introduction). This is achieved by controlling the bluntness of the area distribution of the nose, and thereby the drag of the nose. (Darden, p. 5 and p. 13). Darden only teaches relaxing the bluntness of the <u>nose</u>, not relaxing a design constraint to allow the equivalent area distribution curve of the <u>aircraft</u> (not just the nose) to be at or below the equivalent area distribution goal curve, as set forth in independent Claim 1.

On page 2 of the Final Office Action, the Examiner states that the ideal equivalent area distribution goal curve is what one skilled in the art would want. The Examiner further states that relaxing a design constraint is what one skilled in the art would do to design an optimally performing aircraft. Applicant asserts that if one wants to achieve the ideal equivalent area distribution goal curve, then it would be inconsistent to relax a design constraint to allow a design to have an equivalent area distribution that is below the ideal. Indeed, prior to Applicant's development, aircraft designers were stringently constrained by the ideal distribution goal curve to minimize sonic boom. Applicant is not aware of any efforts or

suggestions that proposed relaxing the ideal distribution goal curve constraint over the length of the aircraft to expand the realm of possible design configurations for supersonic aircraft. While Darden taught relaxing the bluntness of the nose, prior to Applicant's development, the goal was for the rest of the aircraft to meet the ideal distribution goal curve. The drawbacks of the prior art approach are explained on pages 6-7 paragraphs [00016] - [00019] and page 15 paragraphs [00041] - [00042] of the specification.

Further support for the nonobviousness of Applicant's claims is provided in the Evidence Appendix (Section IX) of this document, which includes a diagram of the configuration and a report of the first flight test of the F-5 Shaped Sonic Boom Demonstrator (SSBD-24b4). The SSBD-24b4 was developed under a contract by DARPA and NASA to investigate a method of shaping the sonic boom generated by a supersonic airplane to reduce the overpressure to acceptable levels for flight over populated areas. A Northrop-Grumman F-5 was fitted with a glove over its nose for tests of the effectiveness of the method. The first flight test of the SSBD-24b4 was August 25, 2003, just 3 months before the present application was filed.

The configuration of the SSBD-24b4 includes saddlebags under the wings to keep the area equal to the ideal equivalent area distribution curve while allowing the large modification under the fuselage to begin tapering sooner. If the developers of the SSBD-24b4 aircraft had realized that excursions below the ideal equivalent area distribution curve could be tolerated, the saddlebags could have been eliminated to achieve even lower drag and the same sonic boom ground signature. Further, if the developers would have realized that excursions below the ideal equivalent area distribution curve can be tolerated and still achieve the same ground signature, the large under-fuselage modification could have been tapered with an even smoother, lower drag shape by reducing area bulges to more closely follow the Sears-Haack curve and minimize wave drag. (See explanation of the Sears-Haack curve in paragraph [00020] of the specification.) The fact that the SSBD-24b4 was developed during the same time frame with the same goal as minimizing sonic boom disturbances as embodiments of the present invention indicates that allowing excursions below the ideal equivalent area distribution curve, which would have allowed the drag, weight, and complexity of the saddlebags to be eliminated, was not obvious to those skilled in the art at the time the present application was filed.

On page 3 of the Office Action, the Examiner states that it would have been obvious to one skilled in the art at the time to have expanded the steps of Darden to analyze and design the whole aircraft as taught by Makino or Howe. However, even if Darden, Howe, and/or Makino are combined, the references still fail to teach all the limitations in the claims. The Examiner did not cite specific portions of Darden, Makino, or Howe to support rejection of the claims. Applicant respectfully requests further explanation and citations to relevant portions of the references to support the Examiner's position for each claim if the claims are still not considered allowable.

Independent Claim1is allowable for at least these reasons.

Independent Claim 29 requires "redistributing lift of a wing by configuring the wing with areas of far-field expansion ahead of areas of far-field compression." Darden is only concerned with the shape of the nose bluntness and does not even mention expansion and compression areas on the wing. Rather, Darden confines configuration changes to the fuselage forebody to determine the tradeoff between drag penalty and sonic boom disturbances. (Darden, p. 13). Claim 29 is allowable for at least this reason.

Claims 2-12 and 30-39 depend from Claims 1 and 29, respectively, and include features that further distinguish them from the prior art.

For example, Claim 2 includes "segmenting a wing of the aircraft into panels; analyzing the flow characteristics for each panel; and smoothing the configuration of each panel with adjacent panels along the span and the chord of the wing to smooth the wing surface." The importance of this process is explained at least on page 8 paragraph [00021]-[00022] and page 9 paragraph [00023] of the specification. Claim 3 includes "determining design variables at the root and the tip of a wing of the aircraft along Mach angle lines (X - Beta*R)", which is supported at least on pages 9-10, paragraphs [00024]- [00027]. Claim 4 includes "determining an incidence angle for a wing root of the aircraft for maximum lift-to-drag and connection to a fuselage; and determining the shape of the remaining portions of the wing for maximum lift-to-drag. These features are supported at least on pages 10-11, paragraphs [00028] - [00031]. The Examiner states that Darden teaches these features, but does not provide page numbers to

support the assertions. Applicant has read the Darden reference several times and has not found any sections that teach the features of Claims 2, 3, or 4. Applicant thus submits that Claims 2, 3, and 4 are allowable.

With regard to the rejections of Claims 5, 33, 6, 7, 35, 10, 38, 11, and 39 on page 3 of the Office Action, the Examiner states that one skilled in the art would have taken the steps set forth in the claims to design an aircraft. Applicant respectfully traverses the rejection of Claims 5, 33, 6, 7, 35, 10, 38, 11, and 39 based on the Examiner's assertion that the features as specifically set forth in Claim 5, 33, 6, 7, 35, 10, 38, 11, and 39 are well known in the art and/or inherent. Citations to references in support of this position were requested in Applicant's Response to the Office Action dated January 12, 2006, and have not been provided to date.

I hereby certify that this correspondence is being transmitted to the USPTO on the date shown below:

/Mary Jo Bertani/
(Signature)

Mary Jo Bertani
(Printed Name of Person Signing Certificate)

November 30, 2006
(Date)

Respectfully submitted,

/Mary Jo Bertani/

Mary Jo Bertani
Attorney for Applicant(s)
Reg. No. 42,321

VIII. CLAIMS APPENDIX

Claims remaining in the application are as follows:

1. (Original) A method for configuring an aircraft for low sonic boom supersonic flight conditions comprising:

scaling an equivalent area distribution curve of the aircraft to approximate an ideal equivalent area distribution goal curve; and

relaxing a design constraint to require the equivalent area distribution curve of the aircraft to be at or below the equivalent area distribution goal curve.

2. (Original) The method according to Claim 1 further comprising:

segmenting a wing of the aircraft into panels;

analyzing the flow characteristics for each panel; and

smoothing the configuration of each panel with adjacent panels along the span and the chord of the wing to smooth the wing surface.

3. (Original) The method according to Claim 1 further comprising:

determining design variables at the root and the tip of a wing of the aircraft along Mach angle lines (X - Beta*R).

4. (Original) The method according to Claim 1 further comprising:

determining an incidence angle for a wing root of the aircraft for maximum lift-to-drag and connection to a fuselage; and

determining the shape of the remaining portions of the wing for maximum lift-to-drag.

5. (Original) The method according to Claim 4 further comprising:

re-determining the incidence angle for the root of a wing of the aircraft and the remaining portion of the wing to meet less than or equal to equivalent area low sonic boom constraints and maximum lift-to-drag.

6. (Original) The method according to Claim 1 further comprising:
dividing a flight regime of the aircraft into multiple flight modes;
determining an optimum configuration of non-moving components for one of the flight modes; and
determining an optimum configuration of moving components for the other flight modes based on the configuration of non-moving components.

7. (Original) The method according to Claim 1 further comprising:
determining an optimum configuration according to at least one of: lift-to-drag ratio and low sonic boom.

8. (Original) The method according to Claim 3 further comprising:
limiting the length of the excursion of the equivalent area distribution curve below the equivalent area distribution goal curve by dividing the excursion into at least two smaller excursions.

9. (Original) The method according to Claim 1 further comprising:
determining a minimized sonic boom disturbance of an F-function; and
scaling the equivalent area distribution goal curve to maintain the desired aircraft weight while countering excursions below the equivalent area distribution goal curve.

10. (Original) The method according to Claim 3 further comprising:
analyzing the sonic boom disturbance below and to the side of the aircraft; and
perturbing aircraft design variables to meet sonic boom constraints below and to the side of the aircraft.

11. (Original) The method according to Claim 1 further comprising:
adjusting the configuration of a wing on the aircraft to redistribute areas of lift on the wing; and
reshaping a fuselage of the aircraft in combination with the wing to match the equivalent area distribution goal curve.

12. (Original) The method according to Claim 11 further comprising:

redistributing the areas of lift subject to center-of-pressure constraints to achieve desired balance characteristics for the aircraft.

13-28. (Canceled)

29. (Previously presented) A method for configuring an aircraft for supersonic flight with low shock wave disturbance constraints comprising:

redistributing lift of a wing by configuring the wing with areas of far-field expansion ahead of areas of far-field compression; and

scaling an equivalent area distribution goal curve to maintain the desired aircraft weight while countering excursions below the equivalent area distribution goal curve.

30. (Previously presented) The method according to Claim 29 further comprising:

segmenting the wing into panels;

analyzing the flow characteristics for each panel; and

interpolate the configuration of each panel with adjacent panels to smooth oscillations in the wing surface chordwise, and spanwise along Mach angle lines.

31. (Previously presented) The method according to Claim 29 further comprising:

analyzing perturbations of design variables at the root and the tip of the wing along Mach angle lines.

32. (Previously presented) The method according to Claim 29 further comprising:

analyzing perturbations of design variables along a mid-section portion of the wing.

33. (Previously presented) The method according to Claim 29 further comprising:

determining an incidence angle for the wing for maximum lift-to-drag; and

determining the shape of the remaining portions of the wing for maximum lift-to-drag; and

re-determining the incidence angle and shape of the wing to also meet low sonic boom constraints.

34. (Previously presented) The method according to Claim 29 further comprising: redistributing the lift of the wing with center-of-pressure constraints for aircraft balance.

35. (Previously presented) The method according to Claim 29 further comprising:
dividing a flight regime of the aircraft into multiple flight modes;
determining an optimum configuration according to sonic boom constraints at a flight condition; and
determining another optimum configuration to minimize drag at another flight condition subject to sonic boom constraints.

36. (Previously presented) The method according to Claim 29 further comprising:
dividing the areas of far-field expansion and far-field compression into at least two areas of expansion and compression to reduce the magnitude of the sonic boom disturbance.

37. (Previously presented) The method according to Claim 29 further comprising:
determining a desired magnitude of sonic boom disturbance on an F-function; and
scaling the equivalent area distribution goal curve to maintain the desired aircraft weight while countering excursions below the equivalent area distribution goal to achieve the desired magnitude of sonic boom disturbance.

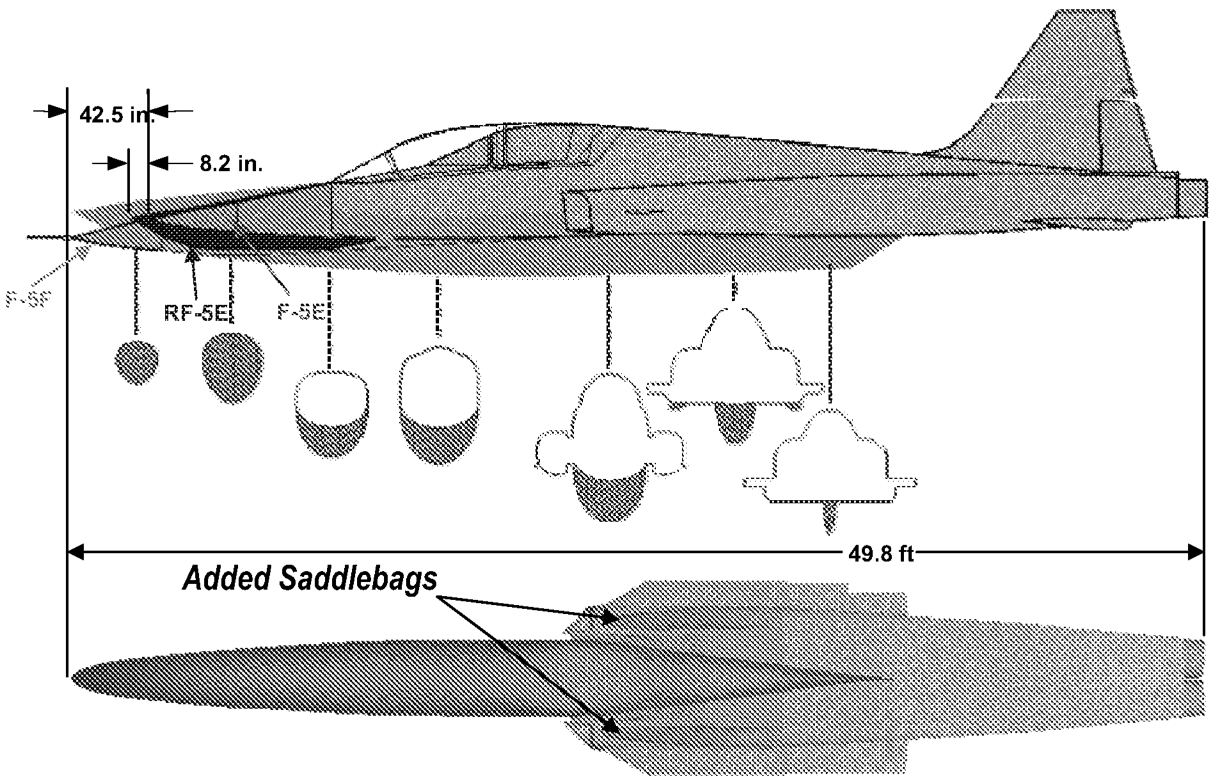
38. (Previously presented) The method according to Claim 29 further comprising:
analyzing the sonic boom disturbance below and to the side of the aircraft; and
configuring the aircraft to meet sonic boom constraints below and to the side of the aircraft.

39. (Previously presented) The method according to Claim 29 further comprising: allowing the user to define a design variable with limits that allow variation in the incidence angle of the wing where the wing joins the aircraft within a range that allows the wing to be connected to the aircraft.

IX. EVIDENCE APPENDIX

F-5 Shaped Sonic Boom Demonstrator (SSBD)

SSBD-24b4 Aircraft Configuration



F-5 Shaped Sonic Boom Demonstrator spotted at Palmdale, August 25, 2003

(Download a higher resolution picture by clicking on any picture below.)

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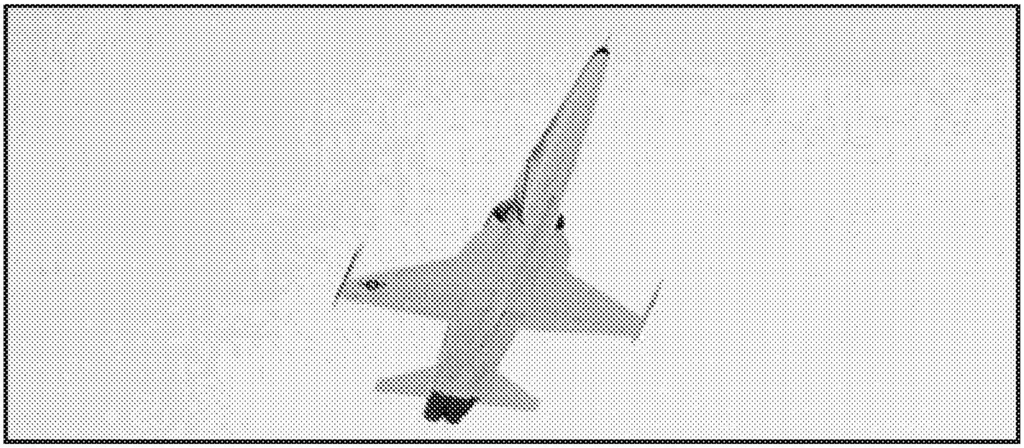
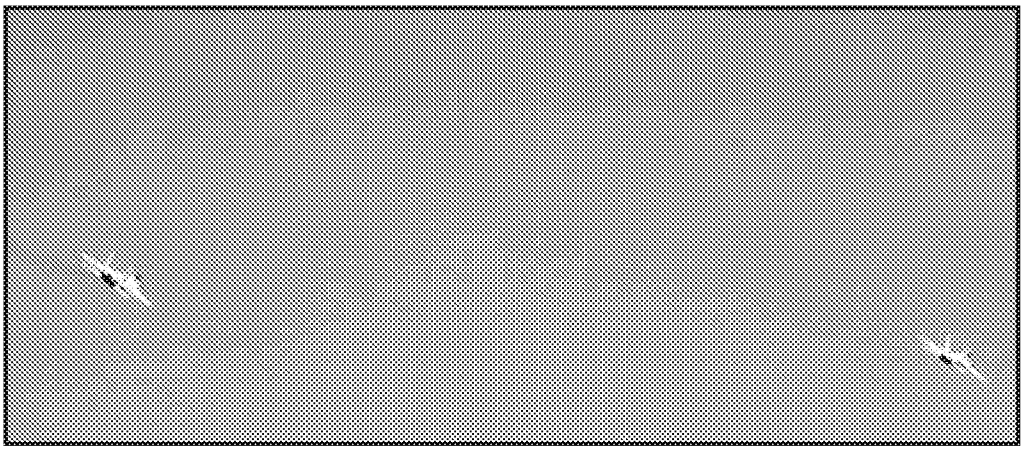
DARPA and NASA are investigating a method of shaping the sonic boom generated by a supersonic airplane to reduce the overpressure to acceptable levels for flight over populated areas. A Northrop-Grumman F-5 has been fitted with a glove over its nose for tests of the effectiveness of the method.

The F-5 Shaped Sonic Boom Demonstrator (SSBD) made a series of flights from Air Force Plant 42 at Palmdale, California during the week of August 25 - 29. The flights took it to Harper Dry Lake, where an array of pressure sensors has been assembled to monitor sonic boom overpressures. Baseline data has been collected from conventional supersonic fighters. A NASA F-15B equipped with pressure sensors collected data as it flew through the shock wave streaming from the F-5 SSBD.

Shortly before 11:00 A.M. on Monday, August 25, the NASA F-15B and a NASA F/A-18B chase plane approached Palmdale Airport from the east. They flew over the field and then circled to catch the F-5 SSBD as it took off.

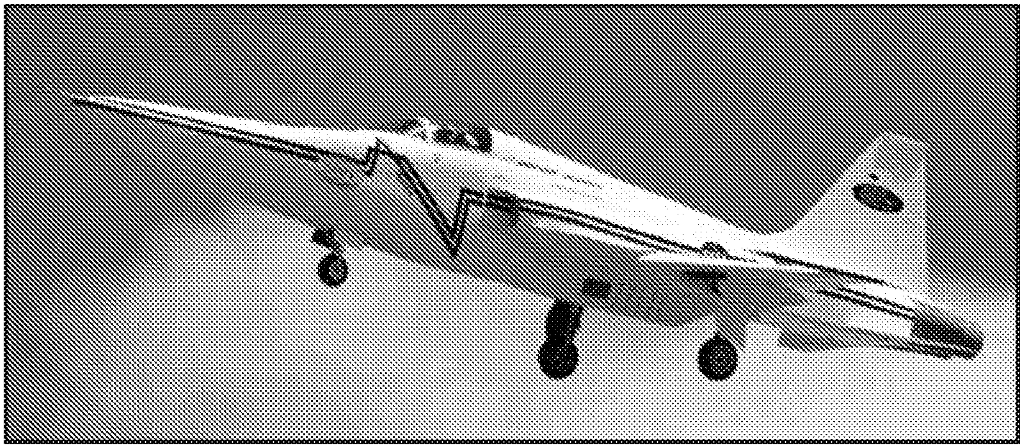

NASA F-15B chase plane flies over the airfield as the F-5 SSBD crosses the horizon after taking off.


The white underside of the F-5 SSBD reflects the red soil of the desert as it passes over Sierra Highway. Aside from havin a longer nose, it does not appear remarkably different from a standard F-5 from this angle.

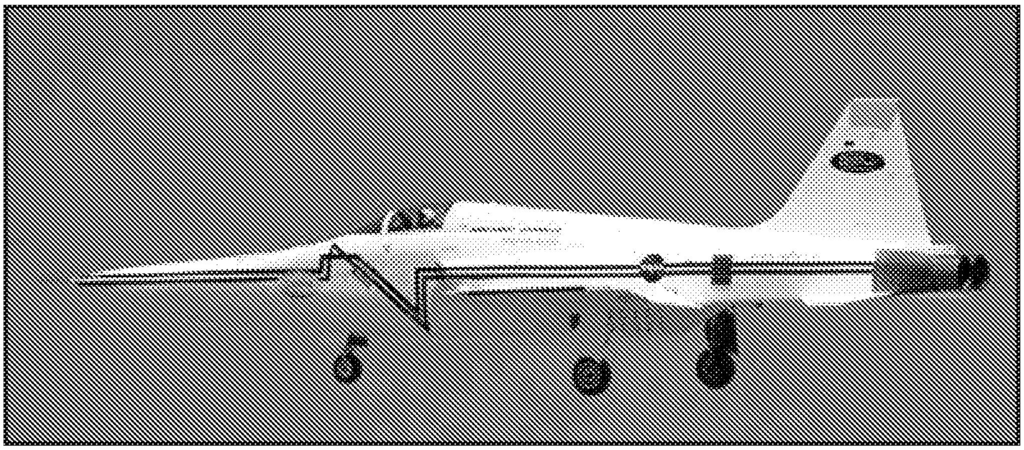

NASA's F-15B and F/A-18B chase planes turn to the north as the F-5 SSBD joins their formation.


The F-5 SSBD joins up with NASA's F-15B and F/A-18B chase planes.

The chase planes were later seen flying behind a Boeing KC-135 Stratotanker over the Palmdale Airport. About forty minutes after taking off, the F-5SSBD returned to the airport. It flew over the airfield and then banked to the left to enter the landing pattern.



F-5 SSBD on approach to landing. The nose glove extends the length of the fuselage and nearly doubles its cross-sectional area. The aircraft is a modified F-5E which has a 42.5 inch extension to the nose to make it the same length as a two seat F-5F. Besides the large fairing under the fuselage is a smaller fairing under each inlet.



According to David H. Graham, SSBD Chief Aerodynamicist, "the pinstriping on the aircraft is a graphic representation of our predicted sonic boom signature of the SSBD (blue) and Baseline F-5E (red). The NASA ground data from Harper Lake looks pretty much the same as the paint scheme and exactly like the predicted signatures."

The F-5 SSBD made two touch-and-go landings to burn off excess fuel.

The F-5 SSBD came to a full stop on its third landing shortly before noon.

Link to the Northrop-Grumman press release about the first SSBD tests.

Link to a photo of the F-5 SSBD in the NASA Dryden Flight Research Center on-line photo collection.

Send a message to Brian.

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X. RELATED PROCEEDINGS APPENDIX

None.